ANALYSIS OF FACTORS AFFECTING RE-BAR STEEL FABRICATION WORKS AND METHODOLOGIES TO OPTIMIZE THE PROCESS

A CASE STUDY FOR THE MAJOR CONSTRUCTION PROJECTS IN SRI LANKA

D.R.H. Liyanage

188715J

Master of Science in Construction Project Management

Department of Civil Engineering

University of Moratuwa
Sri Lanka

June 2024

ANALYSIS OF FACTORS AFFECTING RE-BAR STEEL FABRICATION WORKS AND METHODOLOGIES TO OPTIMIZE THE PROCESS

A CASE STUDY FOR THE MAJOR CONSTRUCTION PROJECTS IN SRI LANKA

By

Deepthi Rohana Hikkaduwe Liyanage

188715J

Supervised by

Dr. Lesly Ekanayaka

"This project report is submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfilment of the requirements for the Master of Science in Construction Project Management."

Department of Civil Engineering

University of Moratuwa

Sri Lanka

June 2024

DECLARATION

"I declare that this Dissertation ", **Analysis of Factors Affecting Re-Bar Steel Fabrication Works and Methodologies to Optimize the Process",** is my own work, and this does not incorporate without acknowledgement of any materials previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and brief it does not contain any material previously published or written by another person except where the acknowledgement made in the text.

Also, I hereby grant the University of Moratuwa the non-exclusive right to reproduce and distribute my dissertation, in whole or in part, in print, electronic or other media. I retain the right to use this content in whole or part in future works (such as articles or books)

Name : D.R.H.Liyanage

Reg No. : 188715J

Signature of the Candidate :

Date :

The above candidate has carried out research for the Masters dissertation under my supervision.

Name of the Supervisor : Dr. Lesly Ekanayaka

Signature of the Supervisor :

Date :

Abstract

Reinforcement (rebar) steelwork plays a major role in the construction industry, especially in high-rise buildings. It is the most valued work item in a high-rise building, accounting for around 12%-15% of the total construction cost. Re-bar work is also one of the most challenging construction activities, which needs skilled labour, competent officers, effective use of cutting and bending machines and effective use of handing machinery. If the fabrication process can be optimized, a considerable construction cost of a project can be saved. With the continuous price increase in steel, it is essential to use effective systems to reduce the cost in order to be competitive in the construction industry. New technologies have been implemented in developed countries to optimize this process, but conventional methods are still used in developing countries like Sri Lanka. Therefore, there is a very good opportunity here to study and analyze the effectiveness of this process and to identify the areas that need to be improved. This paper describes the identification of the factors affecting the production cost and analyses the effects of machines used, transport and handling costs, labour costs and staff costs. This also describes the analysis of the wastage factors in different types of projects using the data collected from completed projects where conventional fabrication methods were used. The factors that have a significant impact on the fabrication cost are identified in the analysis. This study adopted a quantitative approach to collecting data from completed construction projects, using Descriptive, Correlation, and Regression Analysis techniques to analyze the collected data. The theoretical cost of Rebar fabrication in a Centralized Automated Bar Bending Yard was compared with the values obtained from the descriptive analysis to check its financial feasibility. The results of these analyses revealed that the re-bar steel fabrication process in the local construction industry had gained average efficiency in re-bar fabrication works, and the cost of production is marginally acceptable. Further, the cost of cutting and bending machinery and the labour cost had a direct inverse relationship with the production volumes of machinery. The comparison between the average industrial cost of fabrication and the theoretical fabrication cost in the Centralized Automated Bar Bending yard revealed that it is not financially feasible during the economic downturn. However, there is an opportunity for it once the economy of the country becomes normal.

Key word: Cutting and bending Machine, Labour Cost, Re-bar Fabrication Work, Centralized Automated Bar Bending Yard, Production Volumes

Acknowledgement

First, I express my sincere gratitude to my Supervisor Dr. Lesly Ekanayaka and the other lecturers in the Project Management Division of the Department of Civil Engineering at the University of Moratuwa for guiding me in completing this study and for the advice given for preparing this report. Further, I would like to thank Prof Asoka Perera and the Project Management Unit for giving me the opportunity to follow this MSc program, which helped me to improve my knowledge, especially my analytical skills, by doing this research project.

I would also like to thank my family for bearing with me during this difficult and challenging period and for releasing me from my family commitments.

Further, I am grateful to my Employer, ICC Pvt Ltd, especially our Chairman, Mr. Harsha De Saram and CEO, Mr. Namal Peiris, for relieving me from my duties during weekends, enabling me to attend this MSc program.

My special thanks to all the professionals in the construction industry who helped and assisted me in collecting the data required for this study and the clarifications given to get more accurate and reliable data.

Finally, I would like to acknowledge all who helped me in numerous ways in completing this work.

Table of Contents

List of Figures

List of Tables